National Institute of Environmental Health Sciences

European surface ozone in the extreme summer 2003

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Abstract:

Measurements of ozone and other trace species in the European EMEP network in 2003 are presented. The European summer of 2003 was exceptionally warm, and the surface ozone data for central Europe show the highest values since the end of the 1980s. The 95th percentiles of daily maximum hourly ozone concentrations in 2003 were higher than the corresponding parameter measured in any previous year at many sites in France, Germany, Switzerland and Austria. In this paper we argue that a number of positive feedbacks between the weather conditions and ozone contributed to the elevated surface ozone. First, we calculated an extended residence time of air parcels in the atmospheric boundary layer for several sites in central Europe. Second, we show that it is likely that extensive forest fires on the Iberian Peninsula, resulting from the drought and heat, contributed to the peak ozone values in north Europe in August. Third, regional-scale model calculations indicate that enhanced levels of biogenic isoprene could have contributed up to 20% of the peak ozone concentrations. Measurements indicate elevated concentrations of isoprene compared to previous years. Sensitivity runs with a global chemical transport model showed that a reduction in the surface dry deposition due to drought and the elevated air temperature both could have contributed significantly to the enhanced ozone concentrations. Because of climate change, such heat waves may occur more frequently in the future and may gradually overshadow the effect of reduced emissions from anthropogenic sources of VOC and NOx, in controlling surface ozone. Copyright 2008 by the American Geophysical Union.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Air Pollution, Extreme Weather Event, Temperature

Air Pollution: Interaction with Temperature, Ozone, Other Air Pollution

Air Pollution (other): isoprene

Extreme Weather Event: Wildfires

Temperature: Extreme Heat, Fluctuations

Geographic Feature:

resource focuses on specific type of geography

None or Unspecified

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Europe

Health Impact:

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Mitigation

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Time Scale Unspecified